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ABSTRACT

This educational unit on solid waste solutions is intended to convey to students an understanding of the four methods of solid waste handling, in priority order, as recommended by the Environmental Protection Agency: (1) reduction in the volume of waste produced; (2) recycling and composting; (3) waste combustion, i.e., incineration of waste; and (4) sanitary landfilling. Students learn about demonstrating responsible buying decisions, practicing resource and energy conservation, and supporting integrated solid waste management, especially source reduction and recycling. The multi-disciplinary lessons and activities in this guide were designed to enhance and reinforce students' skills in vocabulary building, oral and written communication, research and data collection, charting and graphing, critical thinking, organization, problem-solving and cooperative learning, and citizenship. Materials include a Planet Patrol wall chart (not reproducible here), teacher's lesson guide, student worksheets, parent take-home, and overhead visuals. The topics of the four lessons are sanitary landfills, source reduction, recycling and composting, and waste-to-energy incineration. Each lesson contains the concepts (e.g., source reduction means less garbage), a brief vocabulary list, list of materials needed (e.g., student worksheet, scale, etc.), background information and classroom activities. A list of 14 sources of more information or free/low-cost materials is appended. (KR)

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PLANET PATROL

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An Environmental Unit on Solid Waste Solutions For Grades 4–6

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PLANET PATROL

Dear Educator:

One of the most pressing issues of the 1990s will be what to do with the tons and tons of things that people throw away. As one of the world's largest producers of packaged consumer goods, Procter & Gamble is aware that consumers throw away our packaging and some of our products after using them. That's why we want to help find ways to generate less waste and better dispose of it.

Most of what Americans throw away goes into landfills. Can you imagine a world in which people reuse things rather than discard them? Procter & Gamble envisions this day and has been actively pursuing ways to make it a reality. Not in the next century, but within this decade.

Procter & Gamble believes America is missing dramatic opportunities — to identify many ways to produce less of what we later will discard, to recycle more waste into useful products, to compost, and to generate energy by burning more of our waste. It would not be effective to approach the solid waste situation with only one solution.

The **Planet Patrol** is an environmental unit about solid waste solutions underwritten by Procter & Gamble for upper elementary grades. Explaining the Environmental Protection Agency's integrated approach to solid waste management, **Planet Patrol** provides exciting hands-on activities that will bring these concepts to life in your classroom. Procter & Gamble is excited about the solid waste challenge because we see many ways we can help. We are committed to finding new resources for the future within the solid waste issue we face today. We invite educators like you to share our commitment, and with your students, join the **Planet Patrol**.

Sincerely,

Patti J. Shively

Patti J. Shively
Manager
Procter & Gamble
Educational Services

The Procter & Gamble Company • One Procter & Gamble Plaza • Cincinnati, Ohio 45202

PLANET PATROL

AN EDUCATIONAL UNIT ON SOLID WASTE SOLUTIONS

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Acknowledgments and Special Contributors

For many years, the Procter & Gamble Company has been providing the educational community with curriculum support materials in the areas of Home Economics and Social Studies. These materials are carefully prepared by educators like you who know what works in the classroom. Procter & Gamble gratefully acknowledges the efforts of its Environmental Education Advisory Committee, who assisted in the development and review of these educational materials.

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Introduction

Scientists, politicians and recent events have catapulted our environment into the headlines as one of the issues that will dominate our national agenda in the 1990s. Complex issues ranging from acid rain to ozone depletion, species extinction, global warming and oil spills — these and other environmental problems and their solutions are being examined more closely than ever before.

Among the major environmental problems challenging us now is the issue of solid waste disposal. Americans alone throw out nearly 180 million tons of solid waste each year. That's over 3.5 pounds per person per day, and nearly 80 percent of that waste is deposited in landfills. But the image of floating garbage barges has forced us to focus on a dramatically painful point: our landfills are nearing capacity and few new landfills are being sited. The Environmental Protection Agency expects that by 1991 there will be only 3,300 sanitary landfills in operation. That's 45 percent fewer than there were in 1986. Some major cities, such as Philadelphia, have already exhausted their landfill space.

Each of us generates 1,300 pounds of garbage a year.

What will America do with all its solid waste? Scientists, government, industry and concerned citizens are examining the possibilities. We already know that the solutions will be neither simple nor easy. Indeed, research indicates that there is no single answer.

Instead, our solid waste solutions may lie in a plan such as that proposed by the Environmental Protection Agency, which involves an integrated approach to solid waste disposal. This four-point plan, originally proposed in 1976, advocates a hierarchy of waste management options which include, in order of priority: 1) reducing the amount of waste produced, 2) recycling, reusing and composting, 3) waste-to-energy incineration, and 4) landfilling, as the most effective ways to manage our solid waste.

What we do know is that the stakes are high. Operating in harmony with our environment is important to Procter & Gamble. We recognize the urgency of this issue and our responsibility as one of the world's largest producers of packaged consumer goods to do our part. We believe that designing every P&G product with an eye toward consumer satisfaction and environmental responsibility is consistent with improving the quality of life.

We encourage you to share the information in this classroom unit about solid waste management solutions with your colleagues, your students and their parents. Working together, we all can make a world of difference.

Description of Support Materials

To help teach the concept of solid waste management, you will find the enclosed program support materials:

Planet Patrol Wall Chart

This interactive teaching tool features children of the Planet Patrol and their families demonstrating environmentally responsible behaviors. The chart illustrates the preferred methods for solid waste handling, and provides examples of many products that can be recycled or made from recycled materials.

Teacher's Lesson Guide for Planet Patrol

This 16-page booklet provides comprehensive lesson plans and activities focusing on integrated solid waste management. In addition to giving teachers an overview of the solid waste issue, each of the four lesson plans in the booklet begins with background information, explained in lay terms, specific to the waste management option being presented. Each lesson is clearly outlined, with new vocabulary words, the learning concept being presented, motivational and enrichment activities, and references to appropriate worksheets and overhead visuals enclosed in the packet. The activities are structured to provide you with the flexibility to modify the lessons to the skill level of your students. You will also find a section listing organizations and additional teaching resources that are available on the topic of solid waste.

Student Worksheets

These four worksheets are reproducible on your school copy machine. Duplicate as many as you need for your students. These worksheets are enclosed to provide students with hands-on reinforcement for the educational concepts being taught, as well as to provide you with a useful and convenient evaluation tool to gauge the effectiveness of the teaching materials in conveying the educational concepts.

The four worksheets are:

Count Me In

This worksheet is a chart on which students record every item they throw out for an entire day. The chart provides columns for students to indicate the material category of the discarded item — paper, aluminum, glass, plastic, etc. This chart will be used for a classroom activity which involves characterizing, or profiling, the composition of the classroom's solid waste.

Making a Model

This worksheet provides instruction on how to build a classroom compost column which gives students an opportunity to experience nature's recycling first-hand. The compost column will simulate the conditions of a backyard compost system.

CAUTION: The construction of the compost column requires the use of sharp tools. Each teacher should consider the maturity and skill level of students in determining the amount of assistance and supervision required for the safe construction of the compost column.

Planet Patrol at Work

To be used in conjunction with the wall chart, this worksheet has students identify the various solid waste handling behaviors illustrated on the poster and categorize them by method, such as source reduction, recycling, composting, re-use, incineration and landfilling. Students will also identify behaviors which help the environment and products which are made from recycled material.

On Patrol for Solid Waste Solutions

This fun crossword puzzle will challenge students' knowledge of the solid waste issue, and will provide classroom teachers with an evaluation tool.

Parent Take-home

Because the issue of solid waste management is so critical, it is important for parents to understand what families can do at home and at work to help ease this crisis. The Parent Take-home is also designed to be reproduced on your school copy machine in classroom quantities. We request that you distribute these to students to bring home and share with their parents along with their worksheets.

Overhead Visuals

These graphs and charts visually explain the scope of the solid waste issue and the various methods for handling solid waste. The charts and graphs are referenced in the lesson guide. Photocopy onto an overhead acetate for use on your overhead projector or photocopy on plain paper and distribute as a visual reference for your class.

Evaluation Card

Procter & Gamble has been developing classroom support materials for many years. We value your experience as a classroom teacher, and we invite you to please take a few minutes of your valuable time to complete the evaluation card enclosed in this packet. We listen to what educators tell us, and we rely on that feedback to create materials based on your recommendations. By filling out and returning this card, you can be assured of remaining on our mailing list.

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Program Concepts and Educational Objectives

This unit is intended to convey to students an understanding of the four methods of solid waste handling, in priority order, as recommended by the Environmental Protection Agency. In addition, families will become more aware of the scope of the solid waste problem. They will learn about demonstrating responsible buying decisions, practicing resource and energy conservation, and supporting integrated solid waste management, especially source reduction and recycling. These are gigantic steps toward solving our solid waste crisis.

The multi-disciplinary lessons and activities in this environmental education unit were designed to enhance and reinforce students' skills in:

- vocabulary building
- oral and written communication
- research and data collection
- charting and graphing
- critical thinking
- organization
- problem-solving and cooperative learning
- citizenship

Audience

This classroom unit has been developed for use in grades four through six, with activities appropriate for science, language arts, math and social studies.

About Solid Waste

Overview

First of all, what is solid waste? Solid waste, commonly known as trash or garbage, is everything that is thrown away by households, business, industry and institutions. Soda cans, food, milk jugs, broken toys, fast-food packaging, school papers, newspapers and paper plates, frozen dinner trays, grass clippings, worn out tires, an old sweater...you name it.

First Law of Garbage: Everybody wants us to pick it up, and nobody wants us to put it down.

— from "Characterization of Municipal Solid Waste, 1989." Franklin Associates

Altogether, America generates nearly 180 million tons of solid waste each year, enough garbage to fill a convoy of 10-ton garbage trucks stretching more than halfway from the Earth to the moon. When you throw something away, have you ever wondered where "away" is? For nearly 80 percent of our garbage, "away" is an overburdened sanitary landfill. Only about 11 percent of our waste is recycled, and the remaining 13 percent is incinerated. (Refer to Graph #3.)

As you can see from Graph #1, the materials that make up our solid waste stream include paper, yard clippings, metal, glass, food and plastics. When measuring the composition of municipal solid waste (MSW), it is important to consider both the weight and the volume. (Graphs #1 and 2.) In determining landfill capacity, volume is ultimately of greater importance. Landfills do not close because they are overweight, but because they have reached their volume capacity. The most current scientific evaluation of MSW on the basis of volume is reflected in Graph #2.

In this unit, students will learn about the various materials which make up our solid waste stream and the waste handling options that are most appropriate within the EPA solid waste management hierarchy.

EPA Goals and the Integrated Approach to Waste Management

The EPA has set an agenda for using an integrated waste management system that implements a holistic approach involving:

Source Reduction, to decrease the total volume of waste;

Recycling and composting, to reuse a major portion of waste to further reduce waste going to landfills and incinerators;

Waste combustion, to reduce the bulk of municipal waste, thus conserving valuable landfill capacity, with the added benefit of energy recovery; and

Sanitary landfilling, for those materials which cannot be recycled, composted or safely incinerated and for combustion ash (the matter that's left after incineration).

The EPA has set targets for 1992 that Americans should reduce the solid waste requiring incineration or landfilling by 25 percent. To reach this goal, we must more than double our efforts in the areas of source reduction and recycling.

With an integrated waste management approach providing guidelines, local environmental, economic and institutional needs will play a major role in determining the waste management mix that will work best for each community.

Using Our Natural Resources Wisely

More than half a million trees are used to print our newspapers each Sunday.

In the two centuries that our country has grown and expanded, politicians, businessmen, industrialists, and even citizens like you and me, have thought of our lakes and rivers and our plentiful land and mineral resources as the building blocks of America. Through a concentration on the source reduction, recycling and composting options of integrated waste management, the strain on our natural resources and environment can be greatly reduced.

Government's Role

Historically, the handling of municipal solid waste (MSW) has been the responsibility of local governments. The mid-1960s saw the first action by the federal government to take a more active role in providing guidelines which would assist state and municipal governments in handling their solid waste.

Legislation has included the Solid Waste Disposal Act (1965), the Resource Recovery Act (1970), and the Resource Conservation and Recovery Act (RCRA) (1976). The RCRA deals with the regulation of hazardous waste, the elimination of open dumping, promotion of solid waste management programs and the furthering of solid waste management options in rural communities. These federal laws affect standards for landfilling, waste-to-energy ash management and sanitary landfilling.

Within the area of solid waste management, government can be most effective in providing positive industry and consumer incentives such as tax credits; in supporting the development of recycling and composting technologies and markets; in siting and funding incineration facilities; and in requiring communities to adopt plans that will responsibly address 100 percent of their solid waste. Finally, government can offer technical assistance, education, and research and development, which are key to the informed participation of cities and citizens in any integrated waste management plan.

Industry's Role

In the area of source reduction, industry must:

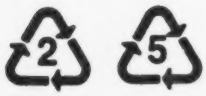
- aggressively pursue opportunities for source reduction;
- use and make products and packages that are recyclable;
- make products compostable if recycling is not feasible; and
- maximize the use of recycled materials (e.g., plastics, aluminum, paper, etc.).

Furthermore, industry can continue working to identify and develop new markets for composted and recycled materials while cooperating with government to form the needed infrastructures for these systems.

Industry can also play an important role in educating consumers about the environmental advantages of certain products and packages. For this to be effective, standards must be developed by which environmental quality is to be evaluated and communicated. Communications must be accurate and technically supportable.

Consumer's Role

Each of us has a very important and influential role to play in resolving the solid waste issue. Did you know that if you shared your feelings and knowledge about this environmental issue with two people one day, and those two each shared it with two more on the second day, and those four with two more each, and on down the line, that within just *one month*, everybody in the whole country could be doing something about the solid waste crisis?



What can one person do? Lots of things! Avoid overpackaged goods. Look for packaging which contains recycled material and can be recycled. When shopping, look for plastic packages which carry the Society of Plastics symbol. This symbol indicates the type of plastic the package is made from, so the plastic can be sorted by type to facilitate recycling. Buy foods in large sizes and buy durable products. Compost grass clippings and leaves. Eliminate household toxic materials from the waste stream by supporting and using collection sites for hazardous household wastes like batteries, pesticides, paint and solvents. If your community does not have a recycling program, help start one.

Write letters to manufacturers asking them to make environmentally responsible products and packaging. Write to your local government officials asking that recycling and composting programs be implemented, and that collection centers for hazardous household waste be initiated.

Don't just get involved, *stay* involved.

What Procter & Gamble Is Doing About Responsible Solid Waste Solutions

Since our founding in 1837, Procter & Gamble has been committed to providing products of superior quality and value that best fill the needs of the world's consumers.

We share the EPA's challenging goals in source reduction, recycling and composting, incineration and landfilling. To help meet these goals, the following are just a few of the steps P&G is taking in each of these areas:

Source Reduction

- reducing the volume and weight of products and packaging
- developing concentrated products which require smaller packages
- using less raw material and reducing waste at our manufacturing plants

Recycling and Composting

- using recycled and recyclable materials whenever possible
- using the Society of Plastics code on our packaging
- encouraging consumer recycling
- undertaking major efforts to encourage the development of the necessary infrastructure to support recycling and composting
- removing heavy metals (e.g., lead and cadmium) from our packaging that can contaminate the compost

Incineration

- removing heavy metals that can concentrate in incinerator ash
- educating the public on the benefits of incineration
- supporting legislation on air emissions standards and safe disposal of ash

Landfill

- avoiding materials that can form harmful leachate or chemical reactions
- developing compactable products that take up less landfill space
- staying abreast of latest degradability technology
- opposing legislation that wrongly positions degradability as a primary method for dealing with solid waste

Introducing the Solid Waste Issue to the Class

After reading all the background information provided above and at the beginning of each of the four lessons in this guide, you should have a good grasp of the solid waste issue. While there is no denying it is a complex, multi-faceted issue, it is nonetheless one that is critical for even the youngest consumers to understand.

As a basis for evaluating students' prior knowledge, before beginning the unit, ask students:

1. What is solid waste, or garbage?
2. What kinds of things make up garbage?
3. Where does garbage come from?
4. Where does garbage go when we throw it away?
5. What can each of us do to reduce the amount of garbage we create every day?

Procter & Gamble's expanded use of recycled plastic in its consumer products bottles will keep 80 million milk, water and soft drink plastic bottles out of our nation's landfills.

When you have completed the entire unit, repeat these questions to your students and see how their knowledge and attitudes about garbage may have changed.

If you have been teaching environmental education, your students may already be aware of the various handling options for solid waste, such as recycling, incineration and sanitary landfilling. What they may not be aware of is how these and other waste handling options such as source reduction and composting should be integrated to work together in a comprehensive plan.

Using Graphs #1, #2 and #3, explain to students the composition of municipal solid waste (MSW) and how America is currently handling its waste. Use Graph #3 to demonstrate how we must re-order our waste handling priorities over the next few years to conserve dwindling landfill capacity. Use Graphs #4 and #5 to show how much garbage per person other industrialized countries produce and how they are handling their solid waste. Graph #6 shows our current trash to landfill ratio, along with the projected situation for the year 2000.

Lesson 1 *Sanitary Landfills:* The Priority of Last Resort

Concepts

1. Sanitary landfill capacity is rapidly diminishing.
2. Sanitary landfills are the least desirable option for disposing of solid waste and should be considered only when all other handling options have been found to be unsuitable.

Vocabulary

Biodegradable — capable of being broken down by bacteria and other organisms into basic elements. Most organic waste, such as food and paper, is biodegradable.

Leachate — a liquid resulting from rainwater and melted snow percolating through landfills containing water, bacteria and decomposed waste.

Municipal Solid Waste (MSW) — what we refer to as trash or garbage, composed of paper, plastic, metal, glass, food, yard clippings and other miscellaneous materials.

NIMBY — "*n*ot *i*n *m*y *b*ackyard," a term used to characterize the public's attitude about landfills and incinerators, meaning that they do not wish one of these facilities to be located near their homes or neighborhoods.

Organic — of plant or animal origin.

Photodegradable — a process, particularly in plastics, whereby the sun's ultraviolet rays attack the connections, or links, in a plastic (polymer) chain causing the plastic to fall apart. Photodegradation does not occur in landfills where no light is present.

Sanitary Landfill — a refuse disposal method for the safe, permanent storage of garbage, having daily coverage of waste with soil, leachate collection systems, methane gas controls and environmental monitoring systems.

Materials

Solid Waste Charts and Graphs
Student Worksheet, "Count Me In"
Two cardboard boxes, one double the capacity of the other
Measured amounts of waste paper, aluminum, plastic or other material
Scale for weighing the filled boxes

More than one-third of all U.S. cities will reach or exceed their landfill capacity by 1991.

What's the Issue?

The EPA has designated sanitary landfills as the last option in the hierarchy of solid waste handling. With nearly 80 percent of our solid waste currently being landfilled, the long-term goal is to reduce the amount of garbage we landfill to only 15 percent. This goal is attainable only if the other options of source reduction, recycling and composting, and incineration are fully developed.

Technologies exist to ensure the environmentally safe site selection, design, operation and closure of landfills. They are equipped with liners to prevent groundwater contamination, leachate monitoring and detection systems, and methane gas controls.

By the mid-1990s, half of our current 6,000 municipal solid waste landfills will be closed. Many of those facilities are in the land-scarce, heavily populated northeastern states. However, those states for which landfill capacity is not an immediate problem may be faced with the issue of "waste flight," that is, whether to accept garbage from other states whose landfills are closed. Because of the NIMBY syndrome, few new landfills are being sited.

There is no doubt that in the future landfills will remain an essential part of comprehensive solid waste management, particularly for nonrecyclables and for the safe disposal of incineration ash.

What Is a Sanitary Landfill?

Simply stated, a sanitary landfill is a place where we bury our garbage. Site suitability for a sanitary landfill is determined only after a potential site has passed stringent legal, environmental and engineering criteria. Careful analysis of surface and subsurface geology, hydrology (water), the nature of adjacent environments, access routes and proximity to waste generation sources is required.

Through careful engineering, a network of drains is designed to retain, collect and then treat all the snow or rainwater which percolates through the landfill before it is finally released.

Landfills are divided into small areas called "cells." These smaller cells minimize the landfill's exposure to wind and rain. Each day, after the waste has been delivered to the site and has been compacted as much as possible, it is covered over with earth or other material to minimize odor and prevent insect and vermin problems.

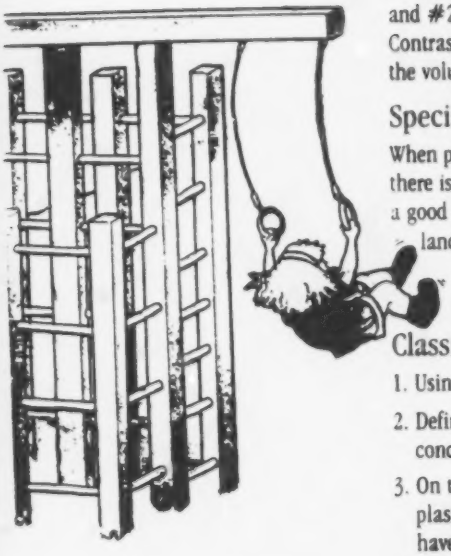
As each cell becomes full, it is capped off and sealed with a layer of clay and earth and is seeded with grass according to an approved closure plan.

What Goes Into a Sanitary Landfill?

"Too much!" says the EPA and a lot of other people. When you analyze the composition of solid waste (Graphs #1 and 2), you can see very clearly that most of what we throw away is far better suited to recycling, composting or incineration. Very little of what goes into our landfills really needs to be there.

Of the 180 million tons of garbage we throw away, nearly 70 percent of it is paper, leaves, grass clippings and food wastes. Technically speaking, all of this is organic, and therefore biodegradable. However, in a landfill it doesn't make much difference whether or not material is biodegradable. Dr. William Rathje, a professor of archeology at the University of Arizona who calls himself a "garbologist," has learned through his studies of landfilled garbage that little, if any, degradation occurs in a landfill. From hot dogs to the Sunday newspaper, Dr. Rathje's work has proved that landfills are entombing and preserving much of our garbage.

Most of the remaining 30 percent of our garbage is glass, metal or plastic. As you can see from Graphs #1 and #2, plastics make up about 8 percent of the waste stream by weight and about 20 percent by volume. Contrast this with the volume of paper, which is almost double that of plastic, and metal which is about half the volume of plastic. All of these materials are perfectly suited to recycling.



Special Problems

When people have a very big problem, they will often look for one big solution. In the instance of solid waste, there is no single solution. Instead, many smaller solutions have to work together. Sometimes what seems like a good solution presents other problems. We have already learned about some of the problems relating to landfills. Space is running out. Nobody wants one in his backyard because of perceived environmental concerns. As Dr. Rathje's work points out, what goes into our landfills will be with us for a long time. Let's think very carefully about how much we can keep OUT of the landfill.

Classroom Activities

1. Using the background information, introduce the concepts and related vocabulary to students.
2. Define for students the difference between organic and inorganic waste. Test students' understanding of this concept by listing examples on the board from student responses.
3. On the board, form column headings for each of the seven MSW materials categories: paper, metals, plastic, yard waste, food waste, glass, and rubber, leather, textiles. Divide the class into seven teams and have each team list as many items for its category as they can think of.
4. Refer students to Graph #1, Composition of MSW by Weight. Have some math fun by asking students to calculate the weight of each of the seven categories of solid waste, based on a total weight of 180 million tons.

5. Graph #6 shows the amount of garbage going into the number of available landfills in 1989 compared with the year 2000. As the amount of garbage increases, the number of available landfills decreases, and with that decrease is a reduction in total landfill capacity, or volume. To demonstrate this relationship with students, have students fill the larger of the two boxes with the waste materials. Have students weigh the filled box, and calculate the volume of the box. Then empty the material from the larger box into the smaller box, adding 20 percent *more* waste material by weight. Discuss factors which may affect capacity, such as type of material, compaction, or removing certain materials from the waste stream through recycling. Have students demonstrate how compaction will increase capacity.
6. Photocopy and distribute to students the worksheet, "Count Me In." This worksheet will require students to list EVERY item they throw away for a full day and to categorize the material by type. (Students may need more than one sheet.) When the worksheets are completed, students will use the information for an exercise in Lesson 2.

Lesson 2 *Source Reduction:* Priority 1

Concepts

1. Source Reduction means making less garbage.

Vocabulary

Efficient — using the most effective and least wasteful means of accomplishing a task.

Lifestyle — ways of living, daily habits which affect the environment.

Reduce — to make or use less of something.

Reuse — to use again.

Repair — to fix or mend.

Materials

Student worksheet, "Count Me In"

What's the Issue?

Source reduction involves products, packaging, manufacturing processes and ways of living which minimize the amount of waste created. By reducing the amount of garbage we create, we will also be reducing the amount of solid waste that must be incinerated or landfilled.

Within the solid waste stream, there are four main categories of refuse (refer to Graph #7):

- **durable goods**, which include furniture, large appliances, tires, etc.;
- **non-durable goods**, which include paper products, clothing, and small plastic products;
- **containers and packaging**, which include cans, bottles, boxes and wrapping material; and
- **other wastes**, which include food and yard wastes and inorganic wastes.

As you can see, after the "Other Wastes" category, containers and packaging are a significant portion of the waste stream — more than 30 percent. It would be easy to point the finger at packaging as a key source of unnecessary waste. However, while there are certainly areas in which packaging can be reduced or even eliminated, there are a number of reasons why packaging is necessary and beneficial:

- Packaging keeps products sanitary.
- It reduces food waste by keeping products fresh. (A study by the University of Arizona found that consumers in Mexico City, where little packaged food is consumed, throw away up to 50 percent more solid waste than U.S. households.)
- Packaging carries necessary usage directions, cautions and warnings.
- Tamper-resistant and child-resistant packaging helps protect consumers.
- Packaging protects the product during shipping and shelf display.

How Is Source Reduction Being Accomplished?

The good news about containers and packaging is that their percentage in the waste stream has actually been declining since 1970. This reduction is due in part to the efforts of consumer products manufacturers, such as Procter & Gamble.

At Procter & Gamble, we are addressing source reduction in three major ways:

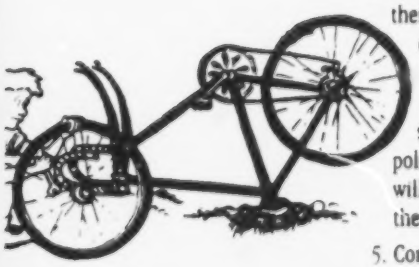
1. designing products and packaging that create less waste;
2. minimizing waste in manufacturing; and
3. encouraging our suppliers to help us come up with more waste saving ideas.

When Procter & Gamble designs products or packaging, we use the most efficient materials. For example, we use plastic rather than glass for bottles because it is lighter weight and shatterproof. If not recycled, it burns to release useful energy when incinerated and its ease of compaction means it takes up less space in a landfill. We are making some of our products more concentrated, and our multifunction products, such as Tide detergent with a bleach additive and Pert Plus which combines shampoo and conditioner, eliminate the need for a separate package purchase. We offer larger product sizes to reduce packaging waste, and refillable containers, long popular in Europe, are now available in America, too. This includes packaging concentrated products such as fabric softener into soft plastic pouches. These products can be poured into refillable bottles and then water is added to complete the process. Wherever possible, we use the least amount of packaging necessary to protect both the consumer and the product.

The first recorded use of packaging occurred in 1551 when a German papermaker began placing his paper in a wrapper with his maker's mark.

Classroom Activities

1. Introduce the concept of source reduction and the related vocabulary.
2. Did you know that Americans produce more garbage per person than any other industrialized country in the world? Display the Overhead Graph #5 to show students how we measure up to other countries when it comes to creating garbage. Ask students to think about why this is so. Look at the lifestyle factors of the different countries which may influence how a product is marketed and sold. For example, in France bakeries regularly sell loaves of unwrapped fresh bread to housewives, who carry them home in a reusable net shopping bag. The Germans, British and Italians buy some of their beverages in bulk, using refillable containers. Also, consider the scarcity of land in the densely populated countries of Western Europe which limits the number of sites that could be designated for landfills.
3. There are many things that companies like Procter & Gamble are doing to reduce the amount of waste being produced. Solicit suggestions from the class on things they can do every day that will help in the area of source reduction. Have each student write and illustrate his suggestion and compile it into a source reduction booklet, or make a class bulletin board. Some possibilities: use both sides of your school paper; try to fix or repair a toy or article of clothing or donate it to charity rather than throw it away; bring your own bags to the grocery store; request that your name be removed from "junk mail" lists; when you buy a good book, share it with a friend; return extra hangers to the dry cleaner for reuse; leave grass clippings on the yard instead of bagging them up for the landfill.
4. Archeologists and anthropologists have learned a lot about ancient cultures and civilizations by studying their debris, or garbage. Divide the class into seven teams, one for each of the seven categories of waste. (Collect the class' "Count Me In" worksheets beforehand, and make seven complete sets, one for each team.) Using the data they've collected on their worksheets, "Count Me In," each team will tabulate, analyze and draw conclusions about its assigned waste category. For example, the "Plastics Patrol" may subdivide its category and tabulate how many milk jugs, soda bottles, six-pack rings, fast-food clamshells, polystyrene lunch trays, eating utensils, etc., were tossed away in just one day by the class. "Patrol" leaders will work together to analyze and draw conclusions about what materials are the greatest contributors to the waste stream and which areas could most easily be reduced.
5. Compare the class' trash profile with Graph #1.



Enrichment Activities

1. After taking an analytic look at themselves, your "Planet Patrol" will have a trained eye for spotting waste. Have students conduct a source reduction audit in your school to see where the greatest amount of waste is occuring. Assign teams to observe and evaluate the various areas: cafeteria; administration offices; building maintenance; classrooms; playground; even the teachers' lounge. Work with students to develop evaluation criteria which include categorizing the type of waste and wasteful behaviors they observe. Have students make specific written suggestions on ways to reduce the amount of waste being generated. Present the suggestions to your principal and write an article about the class' research for the school paper; write a letter to the cafeteria manager or custodian suggesting changes or alternatives.
2. Write skits to get the message to others and perform them for a school assembly or parents' night.

Lesson 3 — *Recycle and Compost:* Priority 2

Concepts

1. Recycling and composting are waste management methods that conserve natural resources, save energy and reduce the strain on incinerators and landfills.
2. A significant portion of all our garbage can be handled using either recycling or composting.
3. After source reduction, recycling and composting are the methods most preferred by the EPA for handling solid waste.

Vocabulary

Composting — the controlled biological decomposition of organic solid waste materials by micro-organisms under aerobic (in the presence of oxygen) conditions. Composting keeps garbage out of the landfill and produces useful soil amendments called humus or mulch for landscaping.

Conserve — to use wisely, and as little as possible.

Natural Resources — include land, water, air and minerals. There are two types of resources: renewable, meaning we can make or grow more; and non-renewable, meaning that when we have used it all up, there will be no more.

Reclaimable — able to be recycled. Reclaimable materials include paper and other wood products, glass, most metals and all types of plastics.

Recycle — a resource recovery method involving the collection and treatment of a particular waste product so it can be used again to make a new product.

Materials

Poster board, markers, paint, glue
"Making a Model" Diagram and Instructions

Every recycled aluminum can saves 6 ounces of oil.

What's the Issue?

Recycling

Recycling is a technology that involves four very important steps: collection, separation, processing of new products, and developing end-use markets for those new products. Separation and collection alone do not make a recycling program. This process is not completed until a material is processed, purchased by consumers and used again.

48 billion aluminum cans were recycled last year.

Today, we are recycling about 11 percent of our solid waste. At present, recycling systems vary widely by material and geography. Much of the material in the waste stream is recyclable: aluminum, glass, plastic and paper. In Japan, where land is scarce and very expensive, recycling accounts for 50 percent of that country's waste management plan. In America, aluminum has achieved a 50 percent recycling rate because of its ease in separation and collection and economic incentives to both can makers and consumers. While paper recycling is well developed, that material is currently experiencing a strain on processing facilities as well as

a sluggish market for its end-product. Glass recycling is well developed, but is complicated by the need to sort the glass by color, and it is reaching market saturation. Great strides have been made in plastics recycling and vigorous efforts are underway to develop systems and markets for this virtually 100 percent recyclable material.

Of course, aluminum is recycled into more aluminum cans, and glass bottles and jars into more of the same. However, recycling has created a whole range of new products that are made from other recycled materials.

Recycled plastics technologies are being applied to a surprising and innovative range of products. Plastic containers can be recycled to make more plastic containers. Recycled plastic can also be extruded into "lumber" to make fencing, landscaping logs, house shingles and roofing shakes, playground equipment, park benches and boat docks. It looks like real wood, but is splinter-free, weather and insect resistant, and extremely durable.

Other uses for recycled plastics include carpet backing and fibers, strapping for outdoor furniture, speed bumps, flower pots, hair combs, garbage pails, fill for ski parkas, detergent bottles and hundreds of other products.

There is an abundant supply of plastic for recycling — nearly 10.5 million tons a year! While certain plastic resins are more resilient than others, research indicates that plastic is better suited to recycling applications than virtually any other material.

The EPA says that by 1992, we should be recycling 25 percent of all our solid waste. Depending on your community, you may or may not be recycling. While recycling actually raises money in some communities, it can be an expensive system to operate in others. This is because there may not be any local materials processing or end-use markets for the materials. In those instances, the EPA recognizes that the benefits of other options in the solid waste management hierarchy, such as incineration or landfilling, will need to be considered.

Composting

Composting is a special type of recycling, whereby organic wastes are converted to a rich humus or mulch by natural decay. Commercial and municipal composting systems were virtually nonexistent a few years ago, however, a host of factors are making composting an attractive waste management option:

- the shortage of landfill space,
- the environmental compatibility of a composting system,
- the low maintenance and operating costs,
- the revenue potential from selling the compost product, and
- public resistance to incineration

Today there are approximately 75 municipal solid waste composting systems in the U.S., with their status ranging from under consideration to fully operational. While these larger systems are a bit more complicated than your backyard compost pile, the basic concept of organic decomposition is the same. By maintaining temperatures greater than 131 degrees Fahrenheit, this municipally-composted material, consisting of food and yard wastes, paper and other miscellaneous organic waste, remains free of dangerous bacteria, and is carefully tested to ensure it meets all regulatory requirements.

Referring again to Graph #1, you can see that paper and paper board make up 40 percent of our garbage, yard clippings nearly 18 percent and food waste over 7 percent. That's a minimum of 65 percent of our garbage that could be composted instead of landfilled! Included among compostable material is the absorbent fiber of disposable diapers. Disposable diapers make up less than 2 percent of all our solid waste.

The people of St. Cloud, Minnesota, have been composting their garbage for about two years. Procter & Gamble has been helping them demonstrate that components of disposable diapers can be composted with other municipal solid waste to produce humus, a useful material for the agricultural and landscaping industries.

There is a long way to go in increasing the number of composting systems, but there is no doubt that composting can play a big part in America's recycling efforts. After source reduction, recycling and composting are the most environmentally desirable ways to handle our garbage in the future.

Classroom Activities

1. Introduce the concepts of recycling and composting, along with the related vocabulary.
2. To teach students to identify which materials are suited for recycling versus composting, it is important that they understand the difference between organic and inorganic materials. Have students bring to class actual items or photos of both organic and inorganic items. Students can create three-dimensional collages of "Organically Yours" and "Inorganically Yours" for posters or bulletin board displays. Don't forget to have students identify the plant or animal origin of each organic item. Ask them to indicate with a symbol or letter code whether the item is best for composting or for recycling.
3. "Pointers from the Planet Patrol." This activity allows each child to share a recycling tip with other students and families. The idea may be a recycling activity that the family is currently doing, or it may be an original idea that helps a family set a recycling goal. Collect the "pointers" and compile them into a format that can be photocopied and sent home with each child. You might also request that one "Pointer from the Planet Patrol" be included in each issue of the school's newsletter. Follow up at the end of the term to survey how many of the "pointers" families have begun practicing.
4. "Planet Patrol Scavenger Hunt, Craft Show and Art Exhibit." This fun activity will challenge imaginations and get family members involved in understanding the concepts of recycling and reuse. Ask students to create an item from discarded materials, and then enter it for judging in a classroom or schoolwide competition. Conduct a classroom brainstorming session which will encourage students to begin thinking about unconventional uses for discarded items.

   You may wish to set up the activity so students can enter under a particular category. For example, under the "Scavenger Hunt" category, entries may be judged on how cleverly the original materials have been disguised. Under "Crafts," the item may be functional, such as a pencil holder, or under "Art" it may be judged purely on its aesthetic appeal, such as a piece of sculpture. Ask your media center director about displaying the entries there, or consider coordinating the display with your school's Parent Night or National Recycling Month in April.

Extension Activities

It boils down not so much to a garbage crisis, as to a crisis in individual responsibility.

— Janet Green, botanist

1. "Planet Patrol In Action." Civic responsibility and environmental awareness are important concepts for children to learn and demonstrate at an early age. Consider contacting your local solid waste director, environmental office, or recycling coordinator and invite them to come and speak to the class about recycling efforts in your community. If there are none, have the class write letters to your local governing body (mayor, city council, county commissioners) asking that they be established.
2. Follow up by having the class organize a recycling effort in school, perhaps focusing on the the material they determined to be the biggest "offender" in their "Count Me In" exercise or Source Reduction Audit.
3. Consider a class trip to your local landfill. It may be a valuable experience for students to see potentially useful material being buried.
4. Divide the class into pairs to construct models of a compost system to observe the decomposing activity which takes place. Follow the diagram and instructions provided on the blackline master, "Making a Model" which simulates the conditions in a backyard compost bin.
5. Make posters encouraging recycling and composting.

Lesson 4 *Waste-to-Energy Incineration:* Priority 3

Concepts

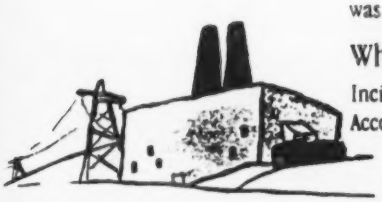
1. Waste-to-energy incineration is a way of handling garbage that reduces its volume and saves landfill space.
2. Waste-to-energy incineration turns garbage into electricity.
3. Waste-to-energy incineration works most effectively and safely in cooperation with recycling programs.

Vocabulary

Air Emissions — the products of incineration such as carbon dioxide and other gases that are released from combustion facilities.
Ash — what is left over after any material is burned.
Combustion — burning.
Incinerate — to burn at very high temperatures.
Waste-to-Energy (WTE) Incinerator — a facility using high temperature burning of waste to generate energy.

Materials

Rolled up newspaper, weight scale (grams up to one kilogram), ruler for measuring dimension, metal wastebasket, long fireplace matches or lighter, two oven mitts, fire extinguisher



What's the Issue?

Incineration reduces the volume of solid waste by about 90 percent and its weight by about 60-70 percent. According to the EPA, there are currently about 135 waste combustion facilities operating in the U.S., with 120 of them recovering energy. Together, they process about 13 percent of our solid waste. Nearly 100 new facilities are under construction, and the EPA's Environmental Task Force that studies garbage predicts that by 1992 almost 20 percent of our solid waste will be processed in these facilities.

When garbage is burned, it produces ash and air emissions. Ash from incinerators is regularly tested for the presence of heavy metals such as cadmium, lead and mercury, as well as hazardous organic materials such as dioxin and furan. Ash from incinerators is placed in specially designated landfills. Like ash from power plants, incinerator ash is also being used as a construction material in recycled pavement and as a concrete additive.

By December of 1990, the EPA expects to issue national air emission standards for waste combustion facilities. In the meantime, states have established their own standards. Many of the same pollution control technologies which are required by law for use in coal-fired power plants are also being successfully applied to waste combustion facilities. Studies have shown that these pollution control devices can effectively remove up to 99 percent of any harmful molecules that might survive the burning process.

Classroom Activities

1. Introduce the concepts and related vocabulary.
2. Demonstrate to the class the effect of incineration on material weight and volume. This demonstration is best conducted out of doors by the teacher. Students can help. First, have students weigh and determine the approximate volume of the rolled-up newspaper. Take the class and the materials for the demonstration outside. Place the newspaper in the waste basket. Ignite the newspaper and allow it to burn to ash. Allow the waste basket to cool completely. Using oven mitts (in case the waste basket is still warm), return the waste basket to the classroom. Remove the ashes and place them in a container whose capacity and weight have been predetermined. Have students calculate the weight of the *asbes only* and determine their approximate volume. Compare your results with the percentage reductions discussed in the background information at the beginning of this lesson.

3. If your community has a waste-to-energy incinerator, consider arranging a field trip. Prepare a list of questions beforehand to ask the tour guide. Questions might include: How much garbage is burned each day? What is the most common material burned? Does the facility work together with a recycling program to screen the type of material that ultimately gets burned? How much electricity do you generate?
4. As discussed above, the air pollution controls on incinerators and coal-fired electric power plants use very similar technology, and some of the ash management and resource recovery programs are also similar. Many local utility companies maintain active community education programs and speakers' bureaus. Contact your local utility for more information and invite a representative to come to your class to explain the pollution control technologies and various ash management plans they use.

Student Evaluation

At the conclusion of the unit, use "Planet Patrol At Work" with the wall poster and the "On Patrol for Solid Waste Solutions" crossword puzzle as further evaluation tools to measure students' understanding of the concepts presented in the unit.

Additional Resources

For more information on solid waste management or other free or low-cost environmental education classroom materials, call or write:

Alliance of Environmental Educators
2111 Wilson Boulevard, Suite 701
Arlington, VA 22201
(703) 875-8660

Bottle Biology Resources Network
University of Wisconsin
1630 Linden Drive
Madison, WI 53705
(608) 263-5645

Council for Solid Waste Solutions
1275 "K" Street, N.W., Suite 400
Washington, D.C. 20005
(202) 371-5319

Keep America Beautiful
Mill River Plaza
9 West Broad Street
Stamford, CT 06902
(203) 323-8987

National Association for Plastic Container Recovery
4828 Parkway Plaza Blvd., Suite 260
Charlotte, NC 28217
(704) 357-3250

National Gardening Association
180 Flynn Avenue
Burlington, VT 05401
(802) 863-1308

Polystyrene Packaging Council, Inc.
1025 Connecticut Avenue, N.W., Suite 508
Washington, D.C. 20036
(202) 822-6424

Public Television Outreach Alliance
"SAVE IT!" Campaign, $4.00 booklets, stickers, posters
2611 Shirlington Road
Arlington, VA 22206
(703) 979-8473

Smithsonian Institution
"A Better World Starts at Home," free poster
Office of Environmental Awareness
Washington, D.C. 20560

Society of the Plastics Industry, Inc.
1275 "K" Street, N.W., Suite 400
Washington, D.C. 20005
(202) 371-5213

U.S. Environmental Protection Agency
Office of Community and Intergovernmental Relations
Mail Code A-108EA
401 "M" Street, S.W.
Washington, D.C. 20460
(202) 382-4454

Electronic Bulletin Board

National Geographic Kids Network
Dorothy Perreca, project manager
Educational Media Division
National Geographic Society
17th and "M" Streets
Washington, D.C. 20036
(202) 775-6580

Audiovisual Materials

"Race to Save the Planet"
global environmental issues
10-part series, airing Fall 1990
Public Broadcasting Service

"Traces of Today"
plastics recycling video
free-loan from Dow Plastics
(800) 258-2436

PLANET PATROL

Count Me In

Solid waste — trash — is getting to be a very big problem. We have too much of it, and now we are running out of places to put it. Did you know that each of us throws away about 3½ pounds of trash every day? This worksheet will help us to understand just how big the trash problem is and what we can do about it.

INSTRUCTIONS: Carry this worksheet with you for one entire day, from the time you wake up until you go to bed. Every time you throw something away, write down the name of the item. Also, put a check mark in the column that says what kind of material it is made of.

ITEM	PAPER	YARD	FOOD	PLASTIC	METAL	GLASS	RUBBER LEATHER TEXTILES
OPTION							

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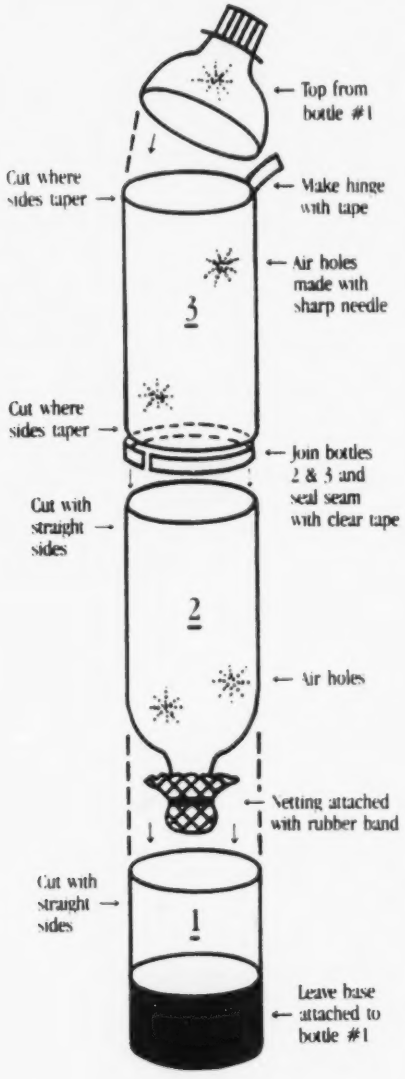
Procter & Gamble Educational Services

PLANET PATROL

Making A Model

Procter & Gamble Educational Services


Top from bottle #1
Cut where sides taper
Make hinge with tape
Air holes made with sharp needle
3
Cut where sides taper
Join bottles 2 & 3 and seal seam with clear tape
Cut with straight sides
2
Air holes
Netting attached with rubber band
Cut with straight sides
1
Leave base attached to bottle #1

Composting is based on the biological process of decomposition. What turns plants and animals into compost? Microscopic bacteria and fungi, which feed on dead tissue, are the important organisms.

What affects the composting process? The amount of moisture and air, temperature, amount of bacteria and fungi, and the nature of the decomposing material are all critical. The presence or absence of air (oxygen) is one of the most important factors in composting. The practice of composting allows air and moisture to speed the natural process of biodegradation. In a backyard composting system, it is customary to run a pole or stick through the compost heap regularly or to turn the material with a shovel to allow air circulation.

Making a compost column lets you see and experiment with this process, and witness nature's world of recycling.

Materials Needed

1. Three 2-liter plastic beverage bottles.
2. Hot tap water, knife, scissors, marking pen, needles or paper clips for poking holes, candle, clear tape, netting or mesh fabric, rubber bands.
3. Organic materials for composting, such as vegetable or fruit kitchen scraps, leaves, newspapers and grass clippings.

Procedure

Remove the bases from two bottles, and the labels from all three, by pouring about two cups of hot tap water into the bottles. (Columns can also be made from bottles that don't have removable bases.) Replace the cap, tilt the bottle so the water softens the heat-sensitive glue, peel off the label and twist off the base. Pour out the water and draw cutting lines around the bottle. Your teacher will help you make incisions with the knife and to cut and assemble the column as illustrated.

Most columns will require air holes for ventilation. These can be poked into the plastic with a sharp needle or paper clip that has been heated in the candle flame under your teacher's supervision. Alternatively, larger holes can be cut into the sides with the knife and covered with fine mesh fabric held in place with tape. **Be sure to use extreme care in using sharp instruments.** A piece of mesh fabric over the lower end allows for drainage. Refer to the illustration. Add ingredients for composting through the top of the column.

Explorations

The possibilities for compost column explorations and discoveries are endless. There is no limit to what can be put inside, or the conditions under which the column can be kept. In addition to simply observing changes, you can design experiments which explore the effects of variables on your column. On the back of this sheet are two ideas:

- **Newspaper Digester.** Make two columns, and use a balance or postal scale to weigh out two equal quantities of newspaper (about ½ pound will do). Shred or cut the paper into strips and loosely pack one column with paper only. Mix about a half cup of garden soil to the other batch of paper and loosely pack the second column. Pour equal amounts of pond or rainwater into each column, and wait several hours for it to seep through. If none comes out the bottom, add more in equal amounts until about a half cup drips into the reservoir. Schedule a rainstorm to occur in the column every few days, pouring the drippings back through the column. Which column decomposes faster and why?

- **Compost Tea.** Compost columns can be used to generate a liquid fertilizer called "compost tea." Try making several columns using different ingredients whose drippings will differ in color and chemistry. Use this liquid to water and fertilize identical sets of seedlings to see how different brands of "tea" affect plant growth.

Adapted from the *Bottle Biology Resources Network*. University of Wisconsin-Madison, 1630 Linden Dr., Madison, WI 53706, (608) 263-5645.
Used with permission.

Contact the Bottle Biology office for help with questions or for information about other activities.

Planet Patrol at Work

In this unit we have learned a lot about the four methods we use to handle solid waste and about the new products that can be made from recycled material. The Planet Patrol poster shows examples of these methods and products. See how many you can spot and list them in the right category of this worksheet. Also look for and list examples of things people are doing to conserve energy and help the environment.

SOURCE REDUCTION

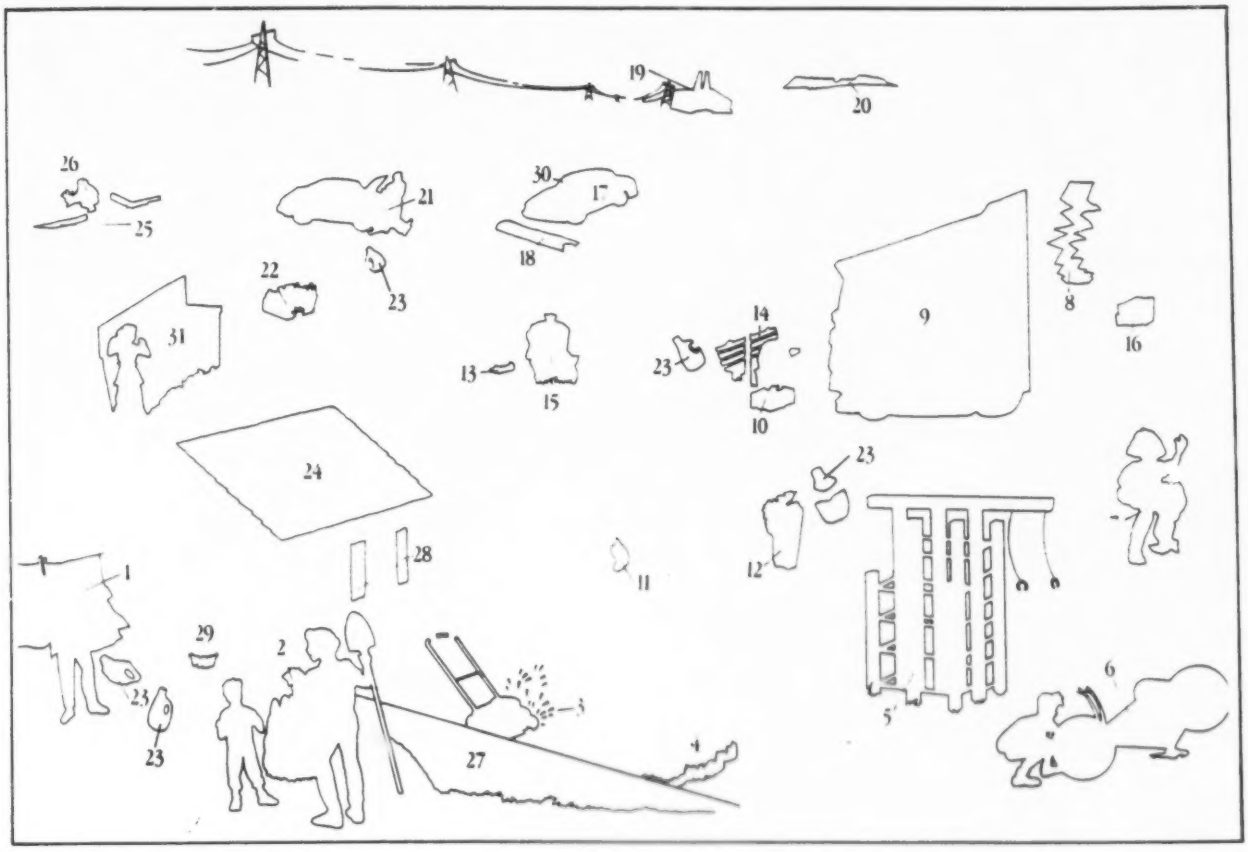
RECYCLING AND COMPOSTING

INCINERATION

LANDFILLING

HELPING THE ENVIRONMENT

MADE FROM RECYCLED MATERIAL
(Look for the recycling symbol)



Source Reduction

3 — Leave grass clippings on yard
4 — Reusing old tires for planters
6 — Repairing bike
7 — Mending clothing
21 — Proper disposal of batteries and oil
11 & 12 — Reusable cloth shopping bags

Recycling

2 — Composting
8 — High quality office paper
10 — Newspapers
13 — Plastic bottles
15 — Aluminum and plastic
22 — Glass bottles
31 — Neighborhood recycling center

Incineration

19 — Waste-to-energy generates electricity

Landfilling

20 — One of the four solid waste solutions

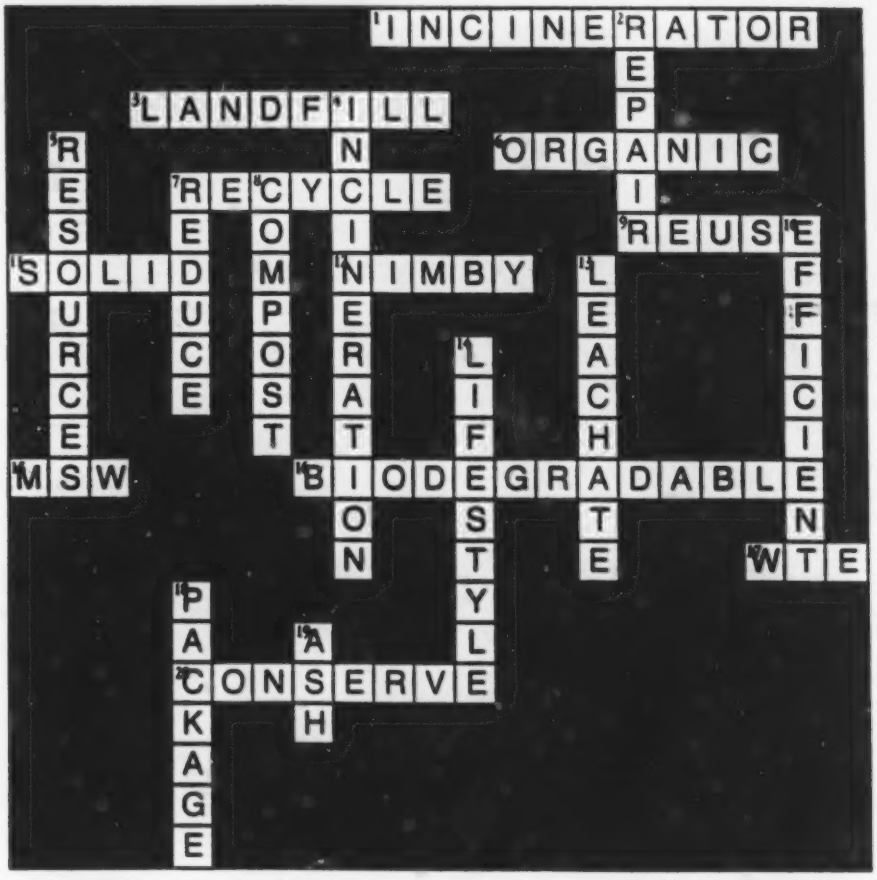
Helping the Environment

1 — Using clothes line instead of dryer
26 — Planting trees and shrubs
17 — Carpooling
9 — Using public transportation
2 — Composting
13 — Smashing soda bottles and cans (makes more room in the Recyclaimer bin)
30 — Open windows in car instead of using air conditioning

Made From Recycled Material

16 — In/Out baskets in office
14 — Park benches
5 — Playground equipment
23 — Downy and Tide bottles
27 — Fencing
25 — Edging logs
28 — Window shutters
29 — Flower pots
18 — Speed bumps
24 — Roofing shingles

On Patrol For Solid Waste Solutions



ACROSS

1. A place where garbage is burned.
3. A place where we bury our garbage.
6. Of plant or animal origin.
7. What we do with paper, plastic, aluminum and glass to save energy and make new products.
9. A form of source reduction that means using a product more than one time.
11. Municipal _____ waste.
12. An attitude that means people don't want to live near a certain kind of facility, whether it is a landfill, a recycling center or a waste-to-energy plant.
15. A way to spell garbage with three consonents.
16. Can be broken down by bacteria when oxygen and moisture are present.
17. Three letters for waste-to-energy.
20. To use wisely, and as little as possible.

DOWN

2. To fix or mend.
4. Burning at very high temperatures.
5. Recycling saves energy and natural _____ .
7. To make or use less of something.
8. A decomposing process that makes humus for the soil.
10. Using the most effective and least wasteful means of accomplishing a task.
13. Liquid that can trickle through a landfill to contaminate ground water.
14. Ways of doing things, daily habits.
18. What an item comes wrapped in.
19. What is left over when garbage is burned.

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Too Much Trash... What Your Family Can Do About It

Procter & Gamble is a leader among corporations concerned about protecting the environment and creating a safer, cleaner world for future generations. We view every P&G product with an eye toward ensuring that the manufacturing and disposal processes are as safe and technologically advanced as they can be.

This week, your child joined the kids of the Procter & Gamble Plant Patrol to learn about responsible ways to handle our trash before we run out of landfill space to bury it. Scientists, environmentalists, politicians and business leaders have been working together to find responsible solutions for handling our trash — what the experts call *solid waste*.

Procter & Gamble recognizes that the management of solid waste is a growing concern in communities across the country. We firmly endorse the integrated approach to solid waste management advocated by the United States Environmental Protection Agency (EPA). We believe that this broad, flexible strategy is essential if we are to achieve the EPA goal of 25 percent reduction in municipal solid waste by 1992.

This plan recommends four effective ways of dealing with solid waste, listed here in their preferred order of use.

1 Source Reduction

This simply means making a national and personal commitment to reduce the amount of material that enters the disposal and landfill system.

2 Recycling, Reuse and Composting

This option places an emphasis on using our resources as thoroughly and efficiently as possible before they are discarded.

3 Waste-to-Energy Incineration

This process provides communities with an independent source of energy by converting waste which can be safely incinerated into useful energy.

4 Landfill

This is a disposal option of last resort which should be reserved for only those materials for which the other three options are not suitable.

What can one family do to help conserve our environment and slow the solid waste crisis? The suggestions listed below for home and office offer ways to make everyone — even grown-ups — partners in the Planet Patrol.

At home...

- Keep mechanical equipment and appliances in good repair to ensure maximum efficiency and product life.
- Lower temperature settings on water heaters, and wash more clothes with cold water.
- Keep thermostats at 65 degrees in winter and 78 degrees in summer.
- Consolidate errands into one trip.
- Install water saving shower heads and faucets, and turn off the water when brushing your teeth.
- Wait until you have a full load to run the washing machine or dish washer.
- Donate your used articles of furniture and clothing to charities for recycling or reuse.
- Take your plastic, glass, paper and aluminum to recycling centers.
- Start a compost system for your grass and yard clippings and other organic material.
- Buy the economy size to reduce the amount of packaging being added to the waste stream.
- Bring your own bags to the store when you shop.
- Return hangers to the dry cleaners for reuse.
- Properly dispose of used motor oil and old batteries.

At work...

- Minimize copies by routing a single copy rather than running multiple copies.
- Use both sides of the paper for copying and writing.
- Recycle soft drink cans and computer paper.
- Carpool or use public transportation.
- Look for ways to use recycled or recyclable materials in your projects.
- Turn the lights off when you're not in the office.

These ideas might seem like very small steps, but remember that when every family pitches in, even just a little, we can all make a world of difference.

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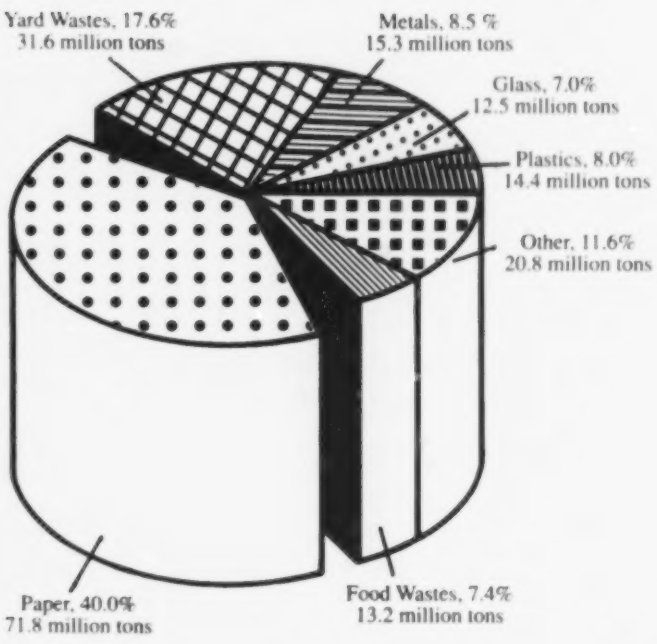
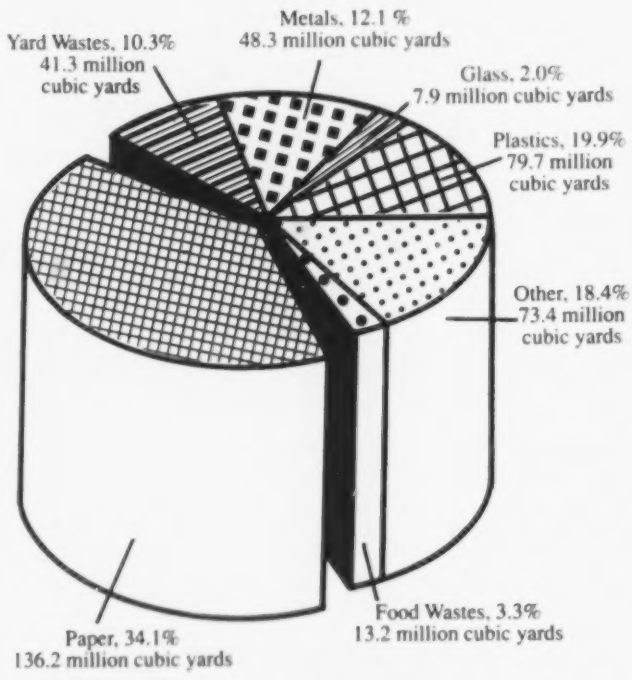
#1 MSW BY WEIGHT, 1988



TOTAL WEIGHT = 179.6 million tons

Source: Executive Summary, Characterization of Municipal Solid Waste in the U.S., 1990 Update, June 1990, EPA Office of Solid Waste

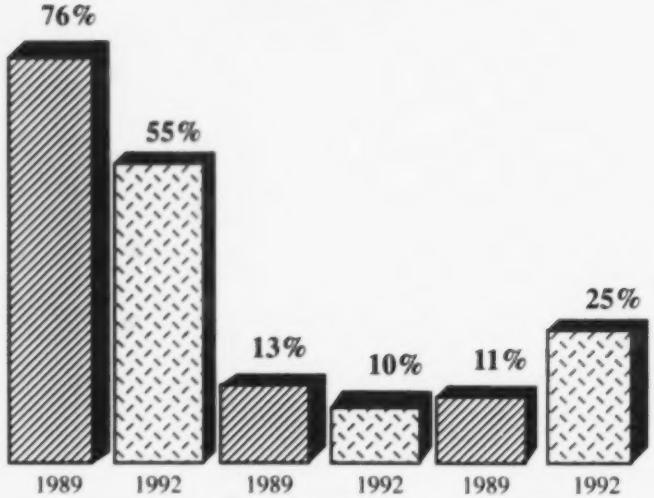
#2 MSW LANDFILL VOLUME, 1988



TOTAL VOLUME = 400 million cubic yards

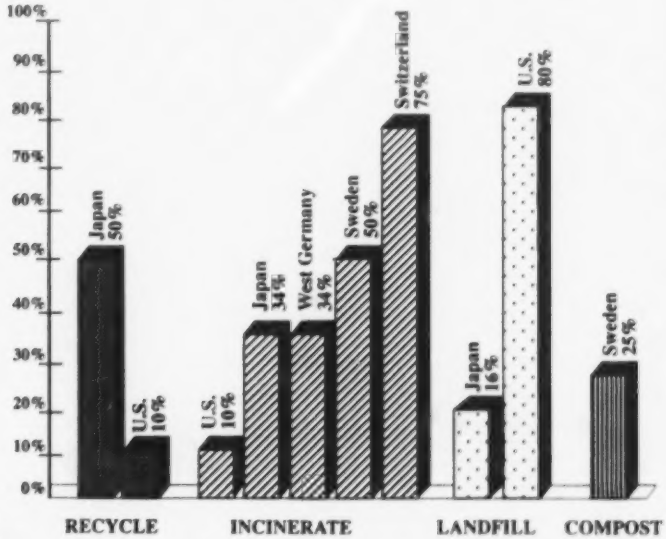
Source: Executive Summary, Characterization of Municipal Solid Waste in the U.S., 1990 Update, June 1990, EPA Office of Solid Waste

#3 HOW AMERICA DISPOSES OF ITS MSW



Source: The Solid Waste Dilemma: An Agenda for Action, February 1989, EPA Municipal Solid Waste Task Force, EPA Office of Solid Waste

#4 HOW SOME OTHER COUNTRIES HANDLE SOLID WASTE



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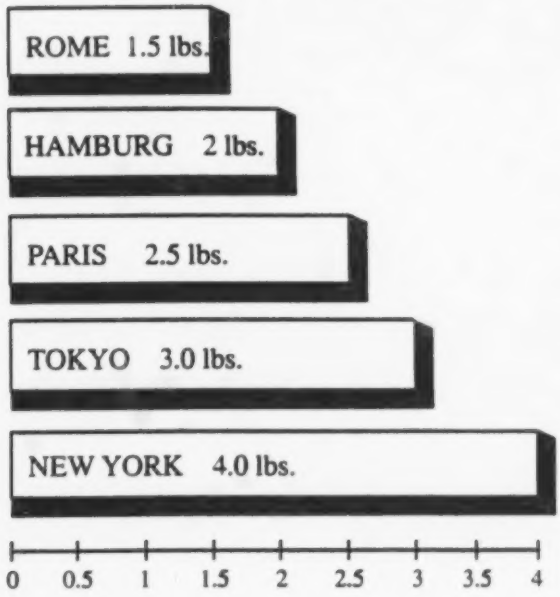
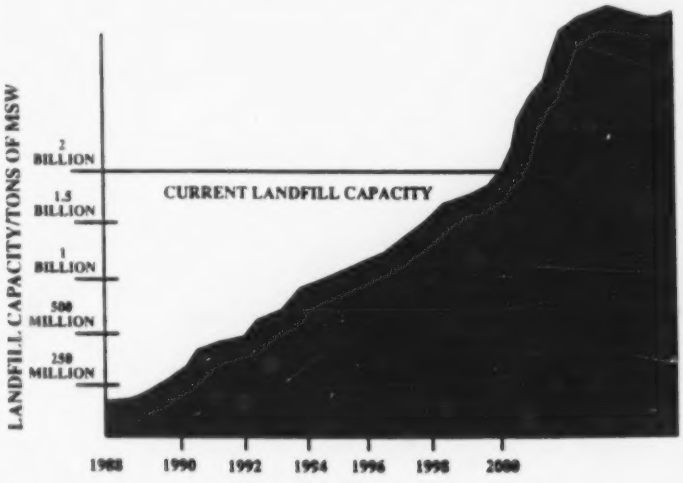
#5 PER CAPITA MSW

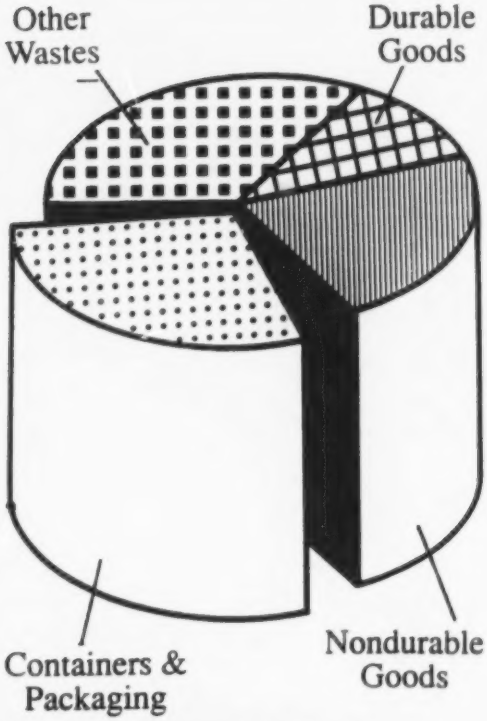


#6 MSW AND DIMINISHING LANDFILL CAPACITY



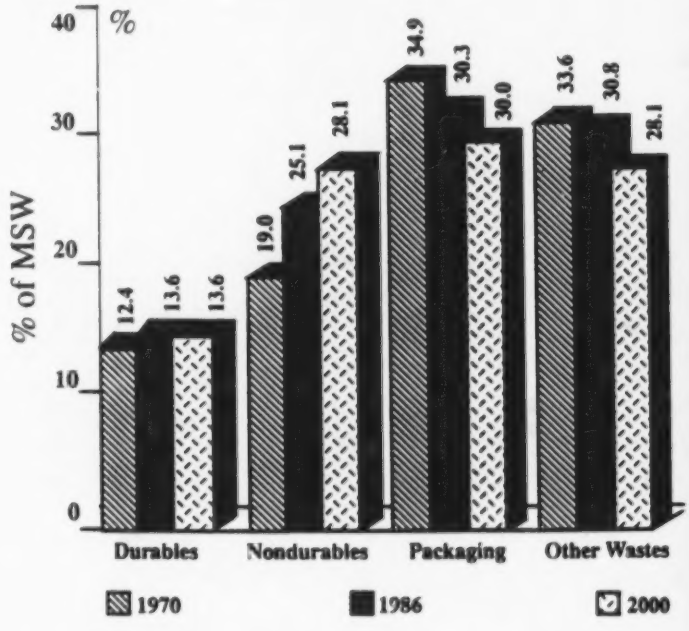
Source: The Solid Waste Management Problem, A Primer on Municipal Solid Waste Management, Council for Solid Waste Solutions.

#7 MSW COMPONENTS



Source: The Solid Waste Management Problem, A Primer on Municipal Solid Waste Management, Council for Solid Waste Solutions.

#8 PACKAGING AND CONTAINERS DECLINE AS MSW COMPONENT



Source: The Solid Waste Management Problem, A Primer on Municipal Solid Waste Management, Council for Solid Waste Solutions.

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